

**ABSTRACT**

Techniques are described for maintaining the orthogonality of user waveforms in multi-user wireless communication systems, such as systems using the code division multiple access (CDMA) modulation scheme in the presence of frequency-selective fading channels. Unlike conventional systems in which spreading is performed on individual information-bearing symbols, the “chip-interleaved block-spreading” (CIBS) techniques described herein spread blocks of symbols. A transmitter includes a block-spreading unit to form a set of chips for each symbol of a block of information-bearing symbols and to produce a stream of chips in which the chips from different sets are interleaved. A pulse shaping unit within the transmitter generates a transmission signal from the stream of interleaved chips and transmits the signal through a communication channel. A receiver includes a block separator to de-interleave the chips, followed by a match filter to separate signals from different users, and followed by any single-user equalizer.